I, the undersigned, who have prepared English translation which is attached herewith, hereby declare that the aforementioned translation is true and correct translation of officially certified copy of the Korean Patent Application No. 2003 19654 filed on March 28, 2003.

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[Abstract of Disclosure]

[Abstract]

Security systems use a video mobile phone that is being rapidly used widely, and especially the security systems use a video processor of the video mobile phone to detect a moving object without additional video processor.

The security system includes a video mobile phone for capturing external images and determining changes from the external images, thereby transmitting alarm signals and compressing to transmit alarm video frames, an alarm generator for receiving alarm control signals from the video mobile phone to alarm, and an alarm video storage device for receiving and storing the alarm video frames transmitted from the video mobile phone.

[Representative Figure]

FIG. 1

[Specification]

[Title of the Invention]

SECURITY SYSTEM USING MOBILE PHONE

[Brief Description of the Drawings]

Fig. 1 is a schematic diagram showing a security system using a video mobile phone.

Fig. 2 is a flowchart showing the operations of the security system using a video mobile phone.

Fig. 3 is a detailed block diagram showing an embodiment of the video mobile phone according to the present invention.

Fig. 4A is a block diagram showing a first embodiment of a video processor illustrated in Fig. 3.

Fig. 4B is a block diagram showing a second embodiment of a video processor illustrated in Fig. 3.

Fig. 5 is a block diagram showing a decoder circuit of the video processor employed in restoring DC coefficient and motion vector for generating compressed video frames in the embodiment illustrated in Fig. 4B.

[Detailed Description of the Invention]

[Object of the Invention]

[Field of the Invention and Conventional Art related to the Invention]

The present invention relates to security systems using a video mobile phone that has been rapidly spreading over the populace, and especially to

security systems using a video processor of the video mobile phone to detect a moving object without additional video processor.

As the present society has rapidly changed, there has been a flood tide of materialism, a tendency of making light of life and a tremendous gap between the rich and the poor, such that a crime rate increases every year. Accordingly, needs and concerns for the security system have increased.

The security systems used in common utilize an extra camera with a charge coupled device (CCD) including a sensor for sensing motions and sounds. With the camera, the security systems detect a moving object and sound to determine whether beyond a threshold value. If beyond the threshold value, the security systems alarm to notify or store the alarm video frames.

Employing those security systems requires high price apparatus and installation works. Therefore, the security systems may not be practically used in general home and office despite the common needs and concerns for the security systems.

[Technical Object of the Invention]

This invention concerns a security system for sensing external moving object using a video processor mounted in a video mobile phone and transmitting alarm signal and alarm video frames.

[Construction of the Invention]

A security surveillance system of the present invention captures external images, determines changes from the captured external images and generates alarm control signal. The security system comprises: a video mobile phone having a function for transmitting alarm images; a alarm generator configured to receive alarm control signal from the video mobile phone and generate alarm; and an alarm image storage device for receiving and storing alarm images from the video mobile phone.

Also, the video mobile phone used in the security surveillance system includes an image input device that captures external images and inputs them in the mobile phone; an image processor configured to compare the video frames inputted from the image input device to determine whether a mobile item is present and outputs the resulting values, and compresses and outputs the video frames according to the control signal; and an alarm controller configured to generate control signals for controlling alarm generation according to the compare results from the image processor.

(Embodiments)

Fig. 1 is a schematic diagram showing a security system using a video mobile phone and Fig. 2 is a flowchart showing the operations of the security system using a video mobile phone.

Referring to Fig. 1 and 2, the security system of the present invention fixes first a video mobile phone 102 having security function in the path expecting an invasion and sets a security mode (step S202).

In the security mode, the video mobile phone 102 inputs external images captured by an installed camera into the video mobile phone 102 (step S204).

The video mobile phone 102 compares the video frames of the external images (step S204) to determine whether there is an invasion 100 (step S208).

If there is an invasion 100, the video mobile phone 102 notifies to a security service or a police or calls to a defined telephone number using radio communications, and alarms (step S210) by an alarm generator 106. At the same time, the video mobile phone 102 transmits wirelessly the captured current external images to alarm video storage devices such as a server of the security service, an adjacent computer or camcorder, thereby using as evidences. If there is no invasion, the video mobile phone repeats comparing operation until the security mode is canceled by a user.

Fig. 3 is a detailed block diagram showing the video mobile phone of

the present invention.

As described above, the video mobile phone of the present invention operates the security function using a video processor mounted in the existing video mobile phone.

The video mobile phone includes a video input device 302, a video processor 304 and an alarm controller. The video input device 302 utilizes an installed camera to capture the external images and inputs video frames IS of the captured external images into the video mobile phone 102. The video processor 304 compares the video frames IS inputted from the video input device 302 to generate the result values RIC with respect to the difference between the frames, and converts the video frames IS according to inputted control signals. The alarm controller 306 controls the alarm according to the result values RIC generated by the video processor 304.

When the security mode is set in the video mobile phone 102 employed in the security system of the present invention, the video input device 302 of the video mobile phone 102 captures the external images with the installed camera and then continuously inputs the captured video frames IS into the video mobile phone 102.

The video processor 304 compares the video frames continuously inputted from the video input device 302 to determine whether there is a moving object and generates the result values RIS. In addition, the video processor 304 compresses and transmits the video frames IS according to the control signals CTR from the alarm controller 310 to an alarm video storage device 104.

Figs. 4A and 4B are block diagrams showing embodiments of a video processor 304 according to the present invention.

Referring to Fig. 4A, the video processor 304 includes a video storage device 404a, a video comparator 406a and a video converter 402a. The video storage device 404a stores the original video frames IS inputted from the video input device 302 or the sampled original video frames. The video comparator

406a compares the video frames IS2 stored in the video storage device 404a to generate the result values RIS of comparing. The video converter 402a generates the compressed video signals CIS of the original video frames IS according to the control signals CTR.

Fig. 4B is another embodiments of the video processor 304 for generating the result values of comparing using the compressed video frames AIS generated from the compressed video signal CIS.

Referring to Fig. 4B, the video processor 304 includes a video converter 402b, a compressed video generator 404b and a video comparator 406b. The video converter 402b compresses the original video frames IS to generates compressed video signals CIS and generates the compressed video signal CIS according to control signals CTR. The compressed video generator 404b generates compressed video frames AIS using a DC coefficient of compressed video signal CIS generated during decoding in the video converter 402b and motion vector MV. The video comparator 406b compares the compressed video frames AIS to generate result values RIS of comparing.

Fig. 5 is a block diagram showing a decoder circuit of the video processor 304 employed in restoring DC coefficient and motion vector for generating compressed video frames AIS in the embodiment illustrated in Fig. 4B.

The compressed video signals CIS is restored to the original video frames by a decoder circuit illustrated in Fig. 5, the compressed video signals CIS being compressed in the type of motion picture expert group (MPEG) or joint picture expert group (JPEG) by the video converter 402b of the video processor 304.

That is, when the compressed video signals CIS are inputted, a variable length decoder 502, an inverse quantizer 504 and an inverse discrete cosine converter 506 of the decoder circuit apply intraframe operation to each frame of the original video frames. A motion compensator 508 using motion

vector MV generated by the variable length decoder 502 applies interframe operation to the continued original video frames. Thus, the original video frames are restored.

In the above restoring process, the compressed video generator 510 generates compressed video frames AIS using the DC coefficient restored by the inverse quantizer 504 and motion vector MV by the variable length decoder 502.

The video comparator 406a or 406b compares the correlation between inputted video frames IS2 or AIS with a threshold value defined by a user to determine whether there is a moving object. In this case, the correlation between the video frames can be obtained by summation of absolute values of differences between the pixel luminance $Y_t(i, j)$ of current video frames and the pixel luminance $Y_{t-r}(i, j)$ of arbitrary previous video frames, as described in the following formula 1:

$$\sum_{i=0}^{N}\sum_{j=0}^{M}\left|Y_t(i,j)-Y_{t-r}(i,j)\right|$$

(N and M are each size of vertical or parallel axis of a video frame. (i, j) is the coordinate value of a pixel)

If there is no change in the inputted video frames, the correlation between the two video frames used in the formula 1 increases to make the value of the formula 1 approximate "0". However, if there is a moving object, the correlation between the two video frames decreases, such that the value of the formula 1 drastically increases. The current video frame $Y_t(i, j)$ may be compared with the adjacent previous video frame $Y_{t-1}(i, j)$. However, when there is only a slight motion, the value of formula 1 may increases linearly and decreases within the limitation of threshold value defined by a user. As a result, the invasion may not be detected. Thus, as referred to the formula 1, even slight motion may be detected by comparing the current frame with an alternative one (e.g., $Y_{t-r}(i, j)$) of the previous frames.

The video comparator 406a or 406b compares the video frames to each other in the above manner and generates the result values RIS of comparing to an alarm controller 306.

The alarm controller 306 generates control signals CTR according to the inputted result values RIS. If a moving object is detected as a result of the comparison, the alarm controller 306 inputs control signals CTR for alarming to the alarm generator 106 and the video processor 304. According to the control signal CTR, the alarm generator 106 alarms and the video processor 304 compresses the inputted external images to transmit to the external alarm video storage device 104.

The transmitted video is stored in the alarm storage device 104 to be used as evidence.

[Effect of the Invention]

The present invention thus provides an effective security system without additional installation works and with low cost.

[Scope of Claim]

1. A security system using mobile phone having security function, comprising:

a video mobile phone having security function for capturing external images, determining changes from the external images to transmit alarm control signals and video frames;

an alarm generator for receiving the alarm control signals from the video mobile phone to alarm; and

an alarm video storage device for receiving and storing the alarm video frames transmitted from the video mobile phone.

2. The security system of claim 1, wherein the video mobile phone comprises:

a video input device for capturing and inputting external images into the video mobile phone;

a video processor for comparing video frames inputted from the video input device to generate the result values and compressing the video frames to generated according to control signals; and

an alarm controller for generating control signals to control the alarm according to the result values generated by the video processor.

3. The security system of claim 2, wherein the video processor comprises:

a video storage device for storing captured video frames inputted from the video input device or storing sampled video frames;

a video comparator for comparing the video frames stored in the video storage device to generate the result values; and

a video converter for compressing and transmitting the video frames according to control signals from the alarm generator.

4. The security system of claim 3, wherein the video comparator compares the sum of absolute values of differences between the pixel luminance of current video frame and the pixel luminance of stored arbitrary video frame with a threshold value defined by an user, thereby generating result values.

5. The security system of claim 2, wherein the video processor comprises:

a video converter for converting the inputted video to generate alarm video according to control signals from an alarm controller and decoding the converted video frames;

a compressed video generator for generating compressed video with video signals generated during decoding by a video converter; and

a video comparator for comparing the compressed video to generate the result values.

6. The security system of claim 5, wherein the compressed video is produced with a DC coefficient selected from the decoding and a motion vector.

7. The security system of claim 5, wherein the video comparator co mpares the sum of absolute values of differences between the pixel luminance of current video frame and the pixel luminance of stored arbitrary video frame with a threshold value defined by an user, thereby generating result values.

8. A method of securing system using a video mobile phone having securing function, comprising the steps of:

a) setting a threshold value becoming a basis to determine whether there is a motion to the video mobile phone, and a security mode thereto by a user;

b) inputting the external images captured with a camera of the video mobile phone into the video mobile phone in the security mode;

c) processing video frames for compressing or storing the inputted video frames and comparing the video frames to generating result values;

d) notifying alarms according to a result of comparing the video frame; and

f) transmitting the video frames inputted to the video mobile phone to a storage device.

9. The method of claim 8, wherein step c) compares the sum of absolute values of differences between the pixel luminance of current video frame and the pixel luminance of stored arbitrary video frame with a threshold value defined by an user, thereby generating result values.

10. The method of claim 9, wherein the video frames are originally captured images.

11. The method of claim 9, wherein the video frames are image frames obtained by sampling originally captured images.

12. The method of claim 9, wherein the video frames are image frames compressed from originally captured images.

Fig. 1

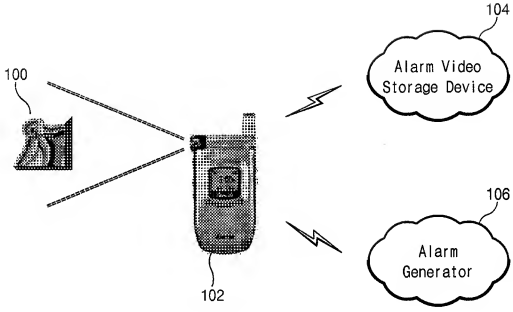

Fig. 2

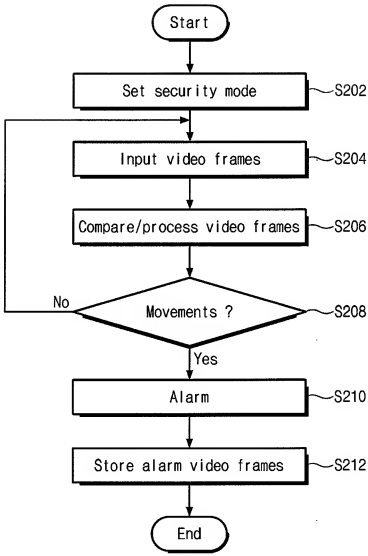
Start
Set security mode
S202
Input video frames
S204
Compare/process video frames
S206
Movements ?
S208
No
Yes
Alarm
S210
Store alarm video frames
S212
End

Fig. 3

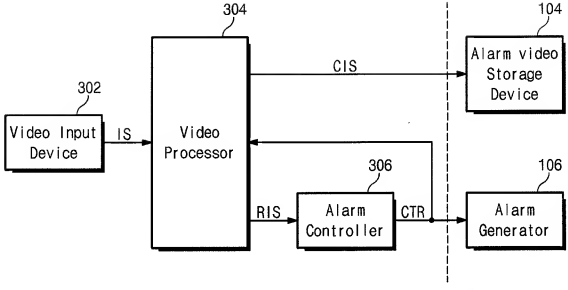
304
104
CIS
Alarm video Storage Device
302
Video Input Device
IS
Video Processor
306
106
RIS
Alarm Controller
CTR
Alarm Generator

Fig. 4A

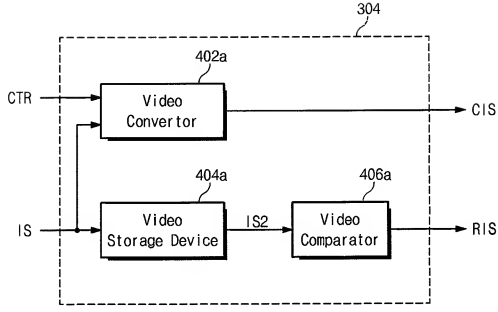
304
402a
CTR
Video Convertor
CIS
404a
406a
IS
Video Storage Device
IS2
Video Comparator
RIS

Fig. 4B

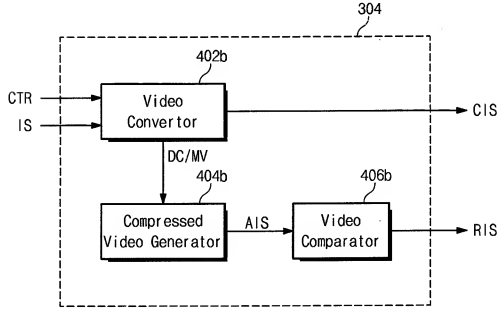
304
402b
CTR
IS
Video Convertor
CIS
DC/MV
404b
406b
Compressed Video Generator
AIS
Video Comparator
RIS

Fig. 5

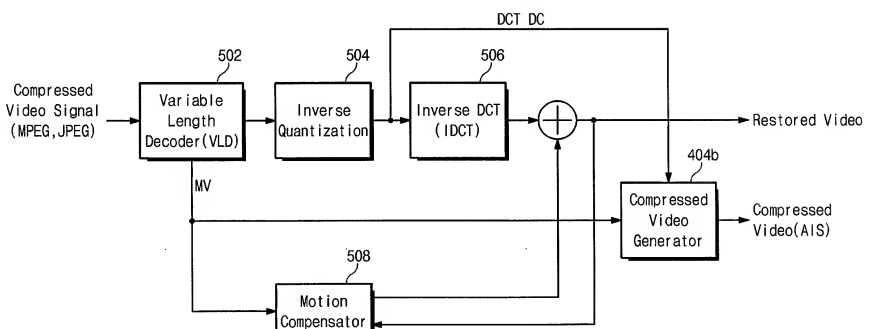
DCT DC
502
504
506
Compressed
Video Signal
(MPEG,JPEG)
Variable
Length
Decoder(VLD)
Inverse
Quantization
Inverse DCT
(IDCT)
Restored Video
404b
MV
Compressed
Video
Generator
Compressed
Video(AIS)
508
Motion
Compensator

Fig. 6